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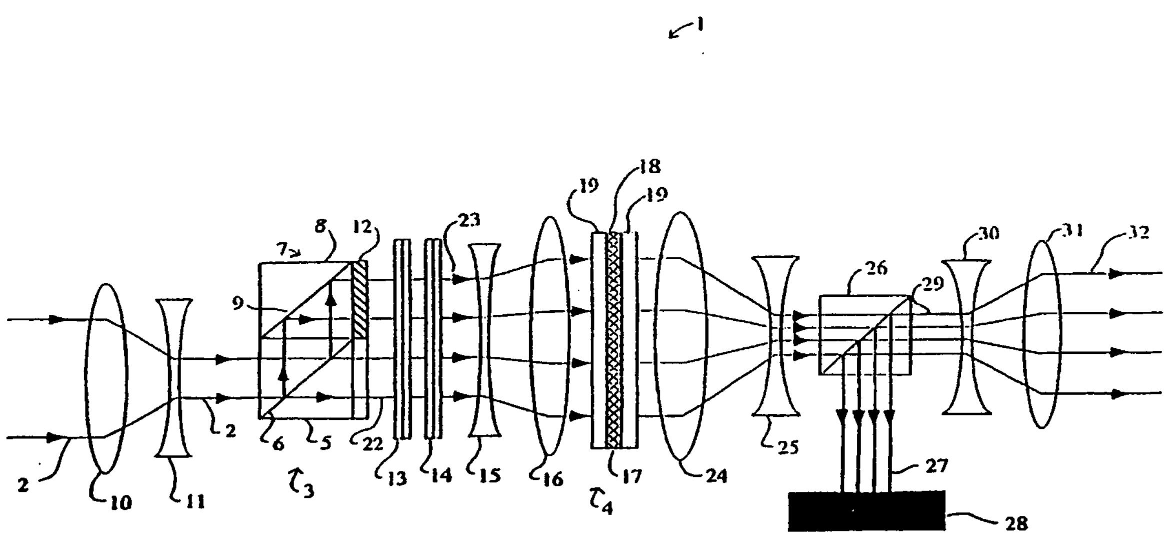

(57) Abstract

Light projection apparatus (1) has a source of unpolarised light (2). The light passes to first polarising means (3) which converts substantially all of the light incident on the polarising means (3) from the source into polarised light. The first polarising means (3) is preferably a polarising cube beam splitter (5). The light passes to image means (4), which preferably includes a liquid crystal cell (17), for generating an image to be projected. A second polarising means such as a polarising cube beam splitter (26) is provided optically after the image means (4) for receiving light passing through the image means (4) and passing a first beam having a first planar polarisation and deflecting a second beam having a second planar polarisation, at least one of the first and second beams providing a projected image.

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LIGHT PROJECTION AND LIGHTING EFFECTS SYSTEMS AND METHODS

The present invention relates to a light projection and lighting effects system and methods.

Various light projection systems are known. One particular system which is used for producing special lighting effects uses a powerful light source to project light through a metal slide (called a "gobo") which is then focused to produce an image. The light beam can be moved by a motorised mirror. In addition, the gobo itself can be rotated. A number of gobos can be loaded into a projector and selected at will. The gobos have different patterns so that a variety of patterns of different shapes can be projected onto a wall or other screen as well as to provide varied beam profile effects. However, the images which can be projected are limited to the particular gobos which are being used. There is no possibility of generating sophisticated images. There is obviously also no possibility of projecting video images when slides are used for carrying the image.

Attempts have been made in the past to project light through a liquid crystal display so as to produce a projection image which can be varied by appropriate control of the liquid crystal cells/pixels which make up the liquid crystal display. However, the problem with liquid crystal displays is that polarising plates are placed either side of the liquid crystal cells, the front polarising plate being conventionally known as the polariser and the rear polarising plate being conventionally known as the analyser. Unpolarised light is caused to be incident on the polariser. Only light having the appropriate planar polarisation passes through the polariser and light of the orthogonal planar polarisation is absorbed by the polariser so that it is not transmitted. However, this absorption of half of the incident light causes the polariser to heat up

significantly when a bright light source is used. The heat build up in the polariser can cause heating of the liquid crystal in the liquid crystal cells by conduction of heat from the polariser, causing breakdown of the device. Similarly, some of the light passing through the analyser on the opposite side of the liquid crystal cells is absorbed by the analyser, again causing heating of the liquid crystal and possible breakdown. Light intensity is lost because of the absorption of light by the polariser. Increasing the intensity of the light source serves only to increase the undesirable heating in the system. Thus, it has not to date been possible to project images through a liquid crystal display which are bright enough for the resultant image to be projected for special lighting effects applications.

Notwithstanding the problems mentioned above, many systems have been described in the prior art for projection of light through a liquid crystal device. Many of such systems are for projection of video images (such as for a film or “movie”). However, in a video image projector, it is fair to say that on average each individual cell or pixel in the liquid crystal device is on for approximately half of the time and off for the other half of the time the device is used and thus heat build up in the analyser is not a particular problem. In contrast, in a lighting effects system, a particular cell or pixel may be on or off for many minutes or even hours at a time. Accordingly, localised heat build up is potentially a major problem in a lighting effects system using liquid crystal displays. Furthermore, a lighting effects system often has to illuminate across large distances (perhaps a hundred metres or more when used in a stadium, for example), requiring the use of powerful light sources. In contrast, video image projectors are being proposed for use often in a domestic environment where the distance from the projector to the

screen may only be a few metres, meaning that much lower power light sources can be used in a video image projector.

US-A-5172254 discloses a light projector. Light from a source is split into two beams of different polarisations which are then passed through their own respective liquid crystal devices. Light emerging from the respective liquid crystal devices is then recombined to produce a final image for projection onto a screen. A colour system is also disclosed in which multiple liquid crystal devices are used. However, the use of plural liquid crystal devices makes the system difficult to set up as the liquid crystal devices for each beam must be very accurately aligned. This is an important issue in a special lighting effects projector which is often subject to rough handling in transit and in use.

US-A-5282121 discusses the problem of heat build up because of absorption by the polariser in a liquid crystal display used in a lighting effects system. The solution to that problem as disclosed in US-A-5282121 is to use a scattering liquid crystal cell in the lighting effects system. However, the use of a scattering liquid crystal cell means that sophisticated cooling arrangements are required to keep down the temperature of the system components in the invention as disclosed in US-A-5282121.

US-A-5283600 discloses an LCD projector which uses a polarising beam splitter to provide beams of light having orthogonal polarisations which are passed through a liquid crystal device having a polariser and an analyser.

According to a first aspect of the present invention, there is provided light projection apparatus, the apparatus comprising: a source of unpolarised light; first polarising means for converting substantially all of the light incident on the first polarising means from the

source into polarised light; image means for generating an image to be projected and through which the polarised light is directed for projected display of said image; and, a polarising beam splitter provided optically after the image means for receiving light passing through the image means and passing a first beam having a first planar polarisation and deflecting a second beam having a second planar polarisation, at least one of the first and second beams providing a projected image.

The invention includes lighting effects apparatus including light projection apparatus as described above.

The polarising beam splitter is preferably a polarising cube beam splitter. (It will be understood that whilst reference is made herein to a polarising "cube" beam splitter, the beam splitter need not be strictly cubic and may have a rectangular cross-sectional shape, for example.)

According to a second aspect of the present invention, there is provided lighting effects apparatus, the apparatus comprising: a source of unpolarised light; first polarising means for converting substantially all of the light incident on the polarising means from the source into polarised light; image means for generating an image to be projected and through which the polarised light is directed for projected display of said image; and, second polarising means provided optically after the image means for receiving light passing through the image means thereby to provide a projected lighting effect.

Because substantially all of the light incident on the first polarising means is converted into polarised light, and half is not lost to a conventional polariser as in the prior art, the image can be practically twice as bright for the same power light source. Also, significant heating of the first polarising means does not take place because half

of the light is not absorbed by the first polarising means as happens with a conventional polariser. This prevents overheating of the system components, especially the often vulnerable image means. It also means that a more powerful light source can be used because little, if any, light is lost that might otherwise cause heating of the system components. This is especially important in a lighting effects apparatus which typically requires very bright images and uses powerful light sources.

Where a polarising beam splitter is provided optically after the image means, again, this serves to prevent components of the apparatus from overheating. This is especially advantageous in lighting effects apparatus in which a particular liquid crystal pixel, for example, may be continuously on for many minutes or even hours at a time. It also allows a negative of the projected image to be obtained which may have application in special lighting effects.

The light projection apparatus described above may be used in a video projection system. Video images (i.e. moving images) may be digitally stored and transmitted to the image means for projected display. Thus, there may be means for digitally storing video images and transmitting said images to the image means for projected display.

According to a third aspect of the present invention, there is provided a method of light projection, the method comprising the steps of: passing unpolarised light to first polarising means which converts substantially all of the light incident on the polarising means from the source into plane polarised light; directing the polarised light through image means which generates an image to be projected for projected display of said image; and, passing the light which passes through the image means through a polarising beam splitter which passes a first beam having a

first planar polarisation and deflects a second beam having a second planar polarisation, at least one of the beams providing a projected image.

A method of providing lighting effects may include a light projection method as described above.

A method of providing video images may include a lighting projection method as described above.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic elevation of a first example of a system of the present invention;

Fig. 2 is a schematic plan view of the example of Fig.1;

Fig. 3 is a perspective schematic view of polarising means;

Fig. 4 is a schematic elevation of a second example of a system of the present invention;

Fig. 5 is a plan view of the example of Figure 4; and,

Fig. 6 is a schematic elevation showing the use of parabolic mirrors to control the size of the light beam.

Referring to Figures 1 to 3 of the drawings, a light projection system 1 has as its main components a source of unpolarised light 2, polarising means 3, and image means 4.

The source of unpolarised light 2 can be a conventional high power light bulb, typically of power 1.2

to 5kW, light from which passes through appropriate optical components. The light 2 passes through a converging lens 10 and a diverging lens 11 which reduce the width of the light beam to a size suitable for entering the polarising means 3.

The polarising means 3, shown in more detail in Figure 3, comprises a polarising cube beam splitter 5 into which the unpolarised light 2 passes. A birefringent layer 6 is formed across one diagonal of the polarising cube beam splitter 5 in a known manner as shown. The polarising cube beam splitter 5 is "tuned" so that it only operates on specific wavelengths of light. Polarising cube beam splitters 5 are available to cover the optical range of 450 to 700nm and which has broad band anti-reflection coatings to minimise reflection losses at boundaries.

The light 2 which is incident on the cube 5 is divided into its two components 20,21 of plane polarisation (the "p" and "s" polarisations). The "p" component 20, which may be polarised in the vertical direction in the drawings for example, passes straight through the cube 5. The "s" component 21, which may be polarised in the horizontal direction in the drawings, is reflected upwards by the birefringent layer 6 as indicated at "A". Deflection means 7, which can be formed by a cube 8 having a planar mirror 9 across one diagonal or a right angled prism for example, is fitted on top of the polarising cube beam splitter 5 to receive the deflected light beam 21. The deflected light beam 21 is reflected by the mirror 9 so as to travel in the same direction as the first transmitted light beam 20. A half-wave plate 12 is fixed to the surface of the deflecting cube 8 through which the deflected light beam 21 exits. The half-wave plate 12 rotates through 90° the polarisation of light which passes through the plate 12. Thus, the polarisation of the light beam 21 after emerging from the half-wave plate 12 is in the same plane or

direction as the polarisation of the transmitted polarised light beam 20 which was transmitted directly by the polarising cube beam splitter 5.

It will be appreciated that substantially all of the light incident on the polarising means 3 is converted into plain polarised light emitted in the same direction. The only losses are the practically negligible losses at any boundaries, such as at the birefringent layer 6, the mirror 9, and the surfaces of the cubes 5,8 through which light 20,21 passes. In contrast, in the prior art, when light is polarised by passing through a conventional polariser prior to entry into a liquid crystal cell, only half of the light is polarised. The other half is absorbed by the polariser, leading to loss of light intensity and also to heating of the polariser. Where the light source is bright (as required for a projection system), the heating of the polariser can be substantial and has conventionally ruled out the possibility of using a liquid crystal in a projection system of this type.

The beam 22 of polarised light emerging from the polarising means 3, which consists of the separate polarised light beams 20,21 discussed above, then passes through a diverging rectangular lens 13 and then through a converging rectangular lens 14. The rectangular lenses 13,14 convert the incident light beam 22 into a light beam 23 of an appropriate size and shape. The polarised light beam 23 then passes through a diverging lens 15 and a converging lens 16 which cause the light beam 23 to expand to the size suitable to fill the single image means 4 constituted by an array of liquid crystal pixels 17.

The liquid crystal cells 17 are formed by a layer of liquid crystal 18 sandwiched between opposed layers of glass 19. The image means 4 can consist of many “pixels” of liquid crystal cells. There may be for example 640 x

480 pixels. Each cell/pixel can be individually addressed by appropriate control means to determine by how much each pixel/cell rotates the polarisation of light passing through it. These pixels collectively make up or generate the required graphic image to be projected. It will be appreciated that the liquid crystal cells do not have a polariser or analyser as is the case with a conventional liquid crystal display.

Depending on the type, liquid crystal cells rotate the polarisation of light transmitted by the liquid crystal by 90° if no voltage is applied to the liquid crystal. When a voltage is applied across the liquid crystal, light is transmitted without its state of polarisation being affected. In a conventional liquid crystal display, a polariser and an analyser which are aligned in the same direction are fixed on the front and back of the liquid crystal cell respectively. Light entering the device is polarised by the polariser. If a voltage is applied to the liquid crystal, light passing through the liquid crystal remains in the same state of polarisation and therefore passes through the analyser; the pixel is "on". If a voltage is not applied to the liquid crystal, the state of polarisation of the polarised light passing through the liquid crystal is rotated by 90° and is therefore completely blocked by the analyser; the pixel is "off".

In another type of liquid crystal cell, the opposite applies so that the polarisation of light is rotated only if a voltage is applied to the liquid crystal cell.

Thus, in the present invention which uses the polarising means 3, the light 23 incident on the liquid crystal cells 17 either has its state of polarisation rotated through 90° or left unaltered, according to whether or not a voltage is applied across the individual liquid crystal cells 17. Grey scale can be achieved in

conventional manner by either varying the angle of rotation of the polarisation or toggling between complete "on" and "off" states at varying frequencies as required, depending on how the liquid crystal cell is controlled.

The modulated light emerging from the image means 4 is passed through a converging lens 24 and a diverging lens 25 to bring the light beam down to a size suitable for passing through a second polarising cube beam splitter 26. The second polarising cube beam splitter 26 is used in place of the analyser conventionally attached to a liquid crystal cell in a conventional liquid crystal display device. It will be appreciated that an analyser could be used as conventional instead of the second polarising cube beam splitter 26. However, a conventional analyser would suffer from the problem of heating by virtue of absorbing the light which it does not transmit. This problem is avoided by use of the second polarising cube beam splitter 26 because, instead of absorbing light which is not transmitted, the non-transmitted light is deflected away as shown at 27 and can be directed to a suitable heat sink 28 if desired. Furthermore, it will be appreciated that the light 27 which is deflected away by the second polarising cube beam splitter 26 is the inverse image of the light 29 which is transmitted by the second polarising cube beam splitter 26. This inverse image 27 could be used to be projected to a different screen from the main transmitted beam 29 so that additional lighting effects can be achieved if desired, or used for some other purpose.

The transmitted light beam 29 passing through the second polarising cube beam splitter 26 is passed through a diverging lens 30 and then through a converging lens 31 so as to produce a final image light beam 32 of the desired size to be projected onto a wall or other screen (not shown).

The various components shown in the drawings are sized so that, if desired, they can simply be fitted into a conventional projector used for lighting effects. Accordingly, in one example, the incoming unpolarised light beam 2 is of circular cross-sectional shape having a diameter of 65mm. The converging lens 10 and diverging lens 11 reduce the diameter of the light beam 2 to approximately 30mm so that most of the light enters a standard polarising cube beam splitter 5 which has a side of 25mm. The emerging polarised light beam 22 is therefore of rectangular cross-sectional shape with size 25mm x 50mm. This rectangular beam is then spread by the rectangular lenses 13,14,15,16 into a beam of square cross-sectional shape having a width of 70mm, this being the width of a screen containing liquid crystal display cells 17 which is presently available. The light beam emerging from the liquid crystal cells 17 is then reduced to a square beam of width 25mm by the converging lens 24 and diverging lens 25 so that all of the light beam can enter the second polarising cube beam splitter 26. The transmitted light beam 29 is then expanded to a width of 65mm by the final diverging lens 30 and converging lens 31.

It will be appreciated that these sizes are mentioned by way of example only. Other combinations of lenses might be used in order to produce light beams of different shapes or sizes according to the application for the system 1.

The example shown in Figures 4 and 5 is similar to the first example discussed above with reference to Figures 1 to 3. Corresponding components have identical reference numerals and will not be further described herein.

The second example differs from the first example in that two adjacent polarising means 3,3' are used to polarise the incoming light 2. The unpolarised light beam 2 passes through rectangular lenses 33,34 which cause the

light beam 2 to take up a shape and size suitable for entering the two adjacent polarising cube beam splitters 5,5'. For example, the light beam entering the polarising cube beam splitters 5,5' might be rectangular and have a width of 50mm and a height of 25mm. The emergent light beam 22, which is already square, passes directly to the diverging lens 15 and converging lens 16 which spread the light beam 22 to a size suitable for entering the image means 4. The rest of the optics and apparatus is as described in the first example mentioned above.

It will be appreciated that the second example of the system 1 shown in Figures 4 and 5 uses two polarising cube beam splitters 5,5' instead of the single polarising cube beam splitter 5 in the polarising means 3. The associated increased expense is offset by the use of fewer lenses overall (the converging and diverging lenses 10,11 and the rectangular lenses 13,14 of the first example being replaced by the rectangular lenses 33,34 of the second example).

Whilst the light emerging from the polarising means 3,3' should be completely polarised in one direction, it is possible for the light to include components polarised in other directions. These components reduce the contrast of the image finally produced and projected. It may therefore be desirable to place a polarising sheet between the polarising means 3,3' and the image means 4 with its plane of polarisation parallel to the main direction of polarisation of the light beam emerging from the polarising means 3,3' in order to "clean up" the light beam by removing the unwanted unpolarised components from the light beam incident on the image means 4. Such polarising sheet should be placed distant from the image means 4 to prevent any heat which may build up in the polarising sheet from being transferred to the liquid crystal cells 17.

In the examples described above, various lenses 10,11,13,14,15,16,24,25,30,31,33,34 are used to control the size and shape of the light beam as it passes through the system 1. Some of the lenses are used particularly to increase the cross-sectional size of the light beam exiting the polarising means 3,3' to fill the image means 4 and to decrease the cross-sectional size of the light beam exiting the image means 4 so that it can pass into the second polarising beam splitter 26. Now, a thick lens can cause distortion of the polarisation of a polarised beam of light passing through the lens. In particular, polarised light rays on the diagonals of a thick lens (i.e. those light rays which pass through the diagonals lying between an axis parallel to the direction of polarisation and an axis perpendicular to the direction of polarisation in the plane of the lens) have their direction of polarisation rotated. This leads to a diagonal cross of light (or dark, as the case may be) projected onto the viewing screen, which is clearly undesirable. Ideally, therefore, thick lenses to adjust the size of the light beam should be avoided.

One way of overcoming the problem of thick lenses is to use an image means 4 and a second polarising beam splitter 26 of substantially the same size and shape so that little or no manipulation of the size and shape of the polarised light beam exiting the image means 4 is required. It may be advantageous for the polarising means 3,3' also to be of the same size and shape as the image means 4 and the second polarising beam splitter 26.

Another way of overcoming the problem of thick lenses is to use aspheric lenses. Such lenses are specially manufactured to behave like ideal thin lenses (for which the approximation $\sin\theta = \theta$ holds true) and therefore have no or substantially no net effect on the direction of polarisation of light passing through the system as the size of the light beam is increased and decreased.

A third way of overcoming the problem of thick lenses is to use parabolic mirrors to adjust the size of the light beam as necessary. This is indicated by way of example in Figure 6. In Figure 6, a parallel beam of light is incident on a first parabolic mirror 40 and is reflected onto a second parabolic mirror 41. The light is reflected from the second parabolic mirror 41 to be in a direction parallel to the light beam incident on the first parabolic mirror 40. In the arrangement shown in Figure 6, the size of the light beam is reduced by reflection by the parabolic mirrors 40,41 and thus the arrangement shown in Figure 6 can replace the converging lens 24 and diverging lens 25 of the examples in Figures 1 to 5. A reverse arrangement of the parabolic mirrors 40,41 can be used to increase the size of a light beam and can thus be used to replace the diverging lens 15 and converging lens 16 of the examples of Figures 1 to 5 if necessary. By definition, the angle of incidence of light incident on each of the parabolic mirrors 40,41 in the arrangement shown is identical, and thus there is no net rotation of the polarisation of any of the light reflected by the parabolic mirrors 40,41. If the parabolic mirrors 40,41 have no glass surfaces and are simply metallic surfaces, for example, then there will be practically no reflection losses at the parabolic mirrors 40,41 nor distortion of the light beam.

In each example, the images which are finally projected are determined by the state of the individual liquid crystal cells 17 in the image means 4. As mentioned above, in order to provide fine resolution, preferably many liquid crystal cells 17 are provided in the image means 4. For example, 640 x 480 or 800 x 600 liquid crystal cells 17 might be used in the image means 4. In a similar manner to a computer display screen, electronics can be provided in order to selectively drive the liquid crystal cells 17 according to the image which is to be projected. Whilst a passive matrix may be used to drive the liquid crystal

cells 17, an active matrix is preferred as higher contrast can be achieved. An image to be obtained can be produced on a computerised system and appropriate voltages applied to the individually-addressable liquid crystal cells 17 of the image means 4. The image could be scanned into the computer and projected immediately, for example. Moving images can be generated by appropriate control of the liquid crystal cells 17, thus providing the possibility of projecting video images by use of a liquid crystal with sufficient image brightness to be viewed by observers. The images can be manipulated, for example rotated, morphed from one to another, distorted, rippled, etc. as desired. Using very many liquid crystal cells will provide a very high resolution display which could be suitable for projecting digitally stored cinematic films ("movies"). This would avoid the need for studios to distribute celluloid films worldwide and, on the contrary, it would be sufficient simply to transmit the digital data to cinemas via satellite, for example.

Whilst absorption of light and resultant build up of heat by the various components of the system 1 described above is minimal, especially when compared to conventional light projection systems using gobos, it may nevertheless be necessary or desirable to cool individual ones of the components. This can be achieved by using for example a sapphire window fixed to an optical component. The sapphire window allows light to pass therethrough, but is a very good conductor of heat and the heat can be removed from the sapphire by any suitable means. A cooling system may be provided for example by forced air passing through or over the system generally.

Embodiments of the present invention have been described with particular reference to the examples illustrated. However, it will be appreciated that variations and modifications may be made to the examples

described within the scope of the present invention. For example, plural polarising beam splitters may be provided after the image means 4 in place of the single polarising cube beam splitter 26 described above, which may mean that lenses or other optical components to adjust the size of the light beam exiting the image means 4 are not required.

CLAIMS

1. Light projection apparatus, the apparatus comprising:

a source of unpolarised light;

first polarising means for converting substantially all of the light incident on the first polarising means from the source into polarised light;

image means for generating an image to be projected and through which the polarised light is directed for projected display of said image; and,

a polarising beam splitter provided optically after the image means for receiving light passing through the image means and passing a first beam having a first planar polarisation and deflecting a second beam having a second planar polarisation, at least one of the first and second beams providing a projected image.

2. Lighting effects apparatus including light projection apparatus according to claim 1.

3. Apparatus according to claim 1 or claim 2, wherein the polarising beam splitter is a polarising cube beam splitter.

4. Lighting effects apparatus, the apparatus comprising:

a source of unpolarised light;

first polarising means for converting substantially all of the light incident on the polarising means from the source into polarised light;

image means for generating an image to be projected and through which the polarised light is directed for projected display of said image; and,

second polarising means provided optically after the image means for receiving light passing through the image means thereby to provide a projected lighting effect.

5. Apparatus according to claim 4, wherein the second polarising means comprises a polarising beam splitter provided optically after the image means for receiving light passing through the image means and passing a first beam having a first planar polarisation and deflecting a second beam having a second planar polarisation, at least one of the first and second beams providing a projected lighting effect.

6. Apparatus according to claim 5, wherein the polarising beam splitter is a polarising cube beam splitter.

7. Apparatus according to any of claims 1 to 6, wherein the first polarising means comprises a polarising beam splitter for passing a first beam having a first planar polarisation and deflecting a second beam having a second planar polarisation, deflecting means for deflecting the second beam to pass in the same direction of travel as the first beam, and polarisation switching means for switching the polarisation of one of the first and second beams to be the same as the polarisation of the other of the first and second beams, thereby producing a projection beam consisting of polarised light from the source.

8. Apparatus according to claim 7, wherein the polarising beam splitter of the first polarising means is a polarising cube beam splitter.

9. Apparatus according to claim 7 or claim 8, wherein the polarisation switching means is arranged to switch the polarisation of the second beam.

10. Apparatus according to claim 7 or claim 8, wherein the polarisation switching means is positioned optically after the polarising beam splitter for switching the polarisation of the first beam.

11. Apparatus according to any of claims 7 to 10, wherein the polarisation switching means is a half-wave plate.

12. Apparatus according to any of claims 7 to 11, wherein the deflection means is a deflection cube containing a mirror.

13. Apparatus according to any of claims 1 to 12, wherein the image means comprises at least one liquid crystal cell.

14. Apparatus according to any of claims 1 to 13, wherein the image means comprises plural pixels each consisting of an individually-addressable liquid crystal cell.

15. Apparatus according to any of claims 1 to 14, wherein the apparatus includes control means for controlling the image means, thereby controlling the image to be projected.

16. Apparatus according to any of claims 1 to 15, comprising at least two parabolic mirrors for adjusting the size of a polarised light beam without any net change in the polarisation of said beam.

17. Apparatus according to claim 4, wherein the second polarising means is a polariser.

18. A video projection apparatus including apparatus according to claim 1.

19. A system including apparatus according to claim 18, and comprising means for digitally storing video images and transmitting said images to the image means for projected display.

20. A method of light projection, the method comprising the steps of:

passing unpolarised light to first polarising means which converts substantially all of the light incident on the polarising means from the source into plane polarised light;

directing the polarised light through image means which generates an image to be projected for projected display of said image; and,

passing the light which passes through the image means through a polarising beam splitter which passes a first beam having a first planar polarisation and deflects a second beam having a second planar polarisation, at least one of the beams providing a projected image.

21. A method according to claim 20, comprising the step of controlling the image means to control the image to be projected.

22. A method of providing lighting effects, including a light projection method according to claim 20 or claim 21.

23. A method of providing video images, including a lighting projection method according to claim 20 or claim 21.

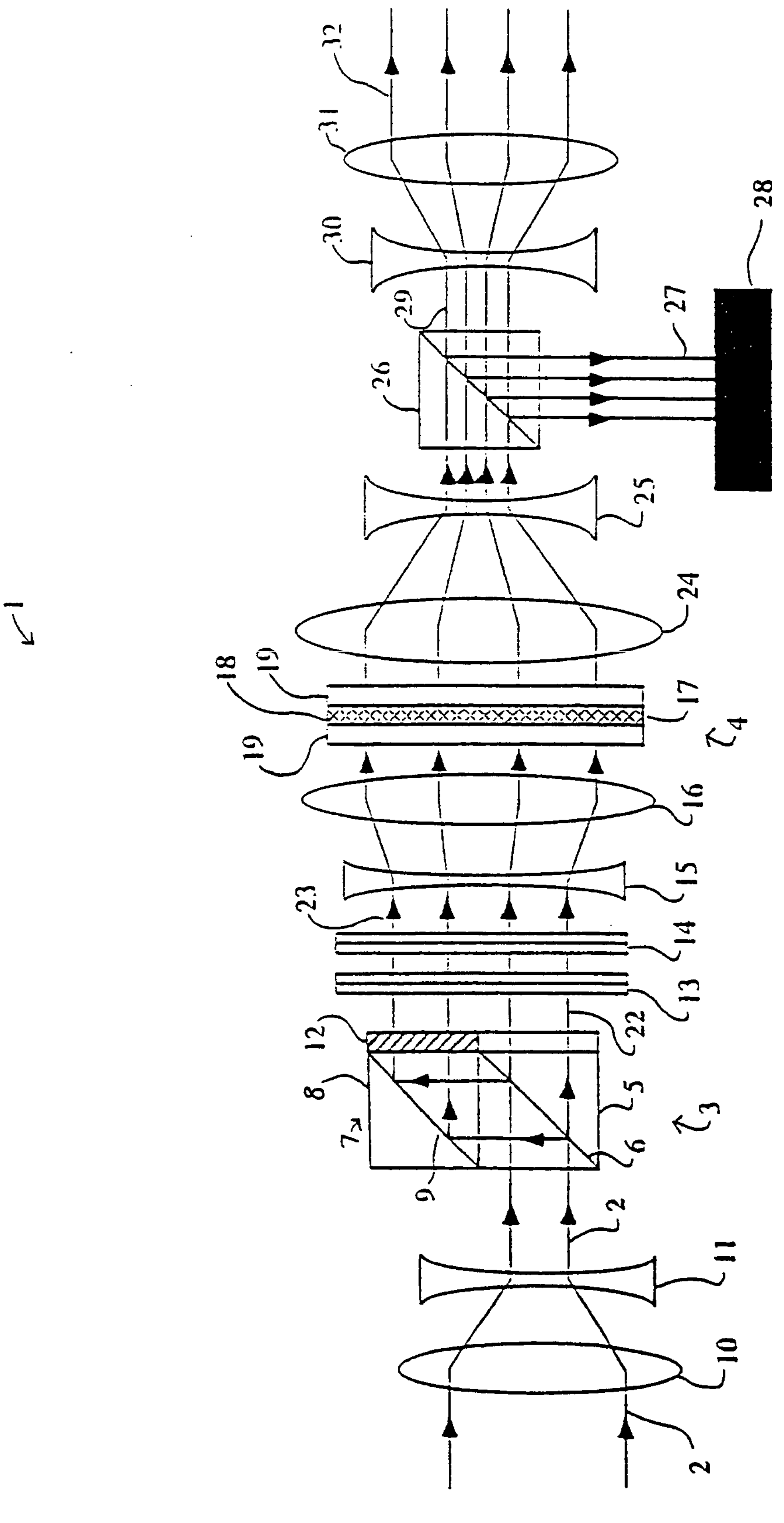
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FIG. 1

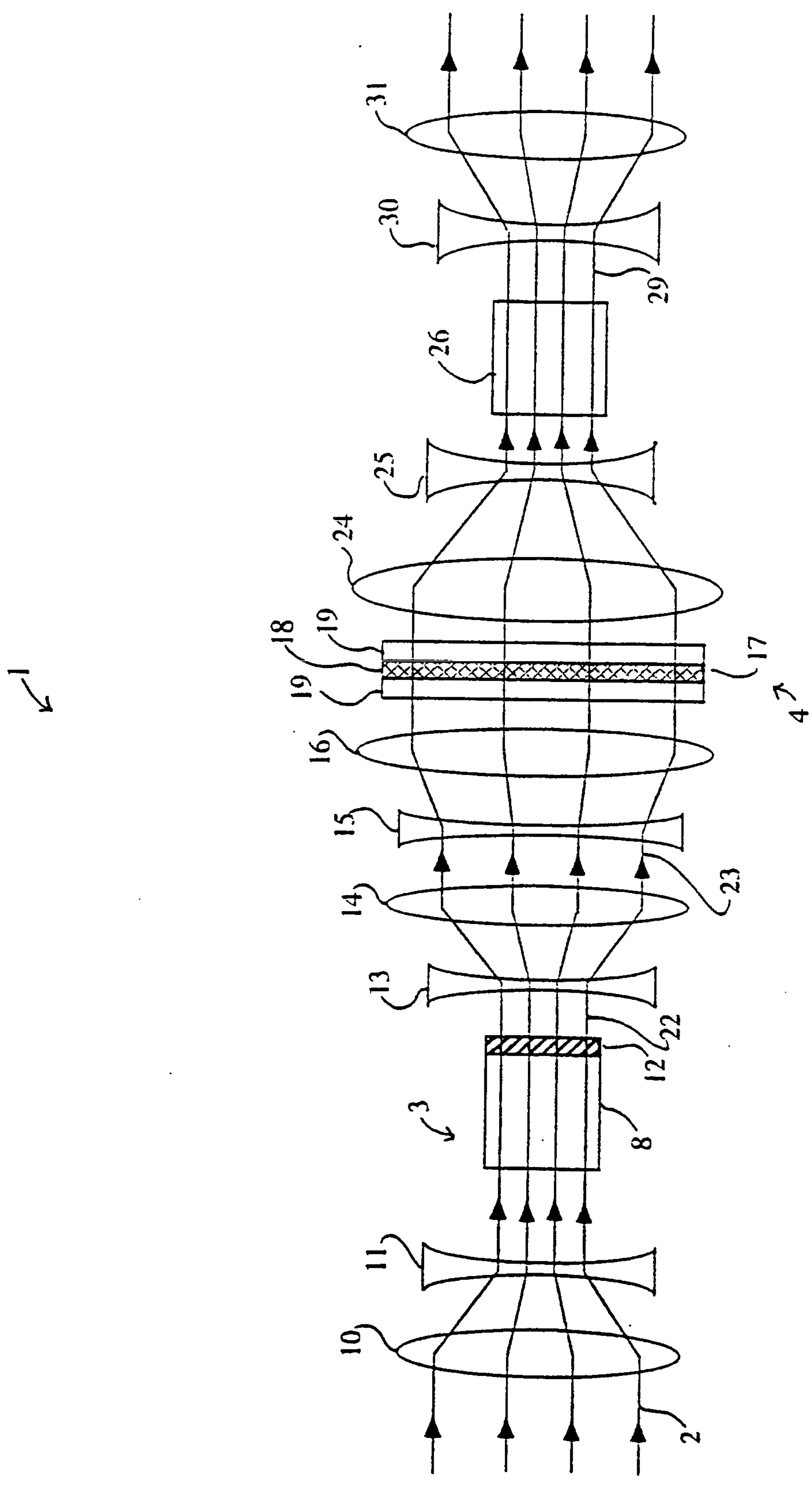

FIG. 2

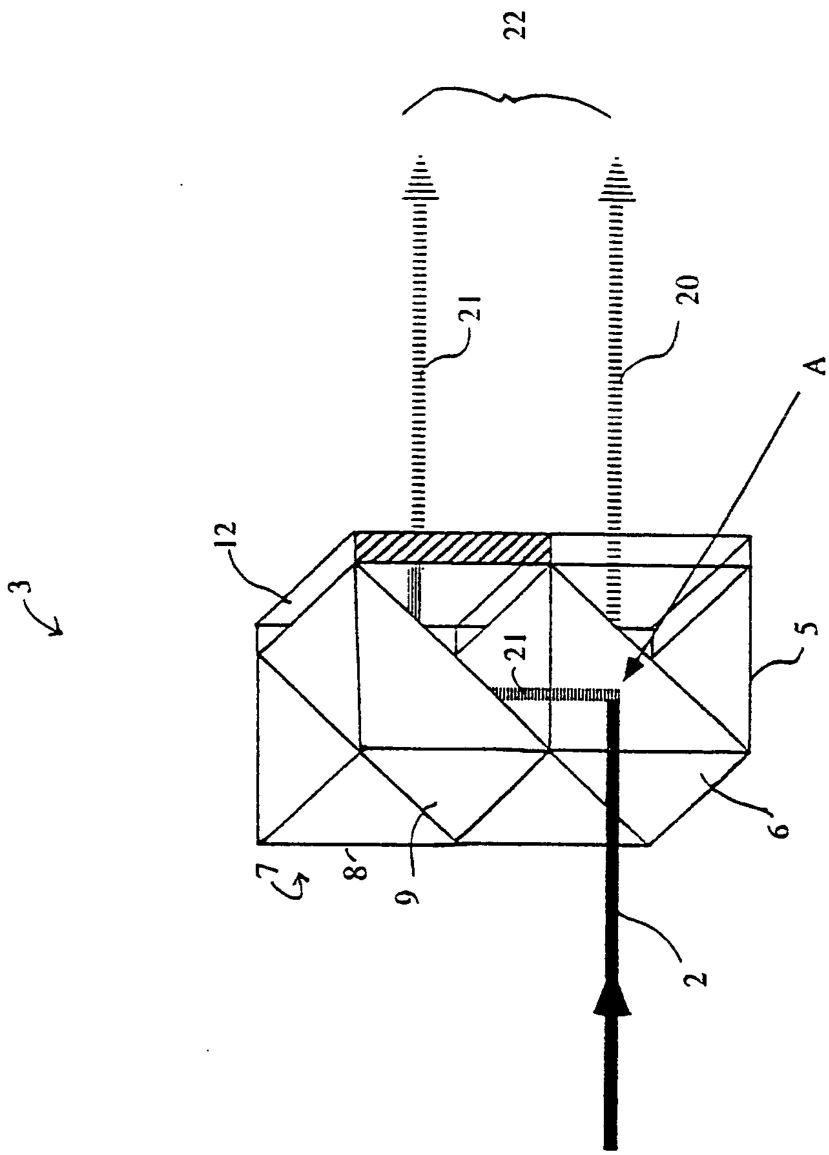

FIG. 3

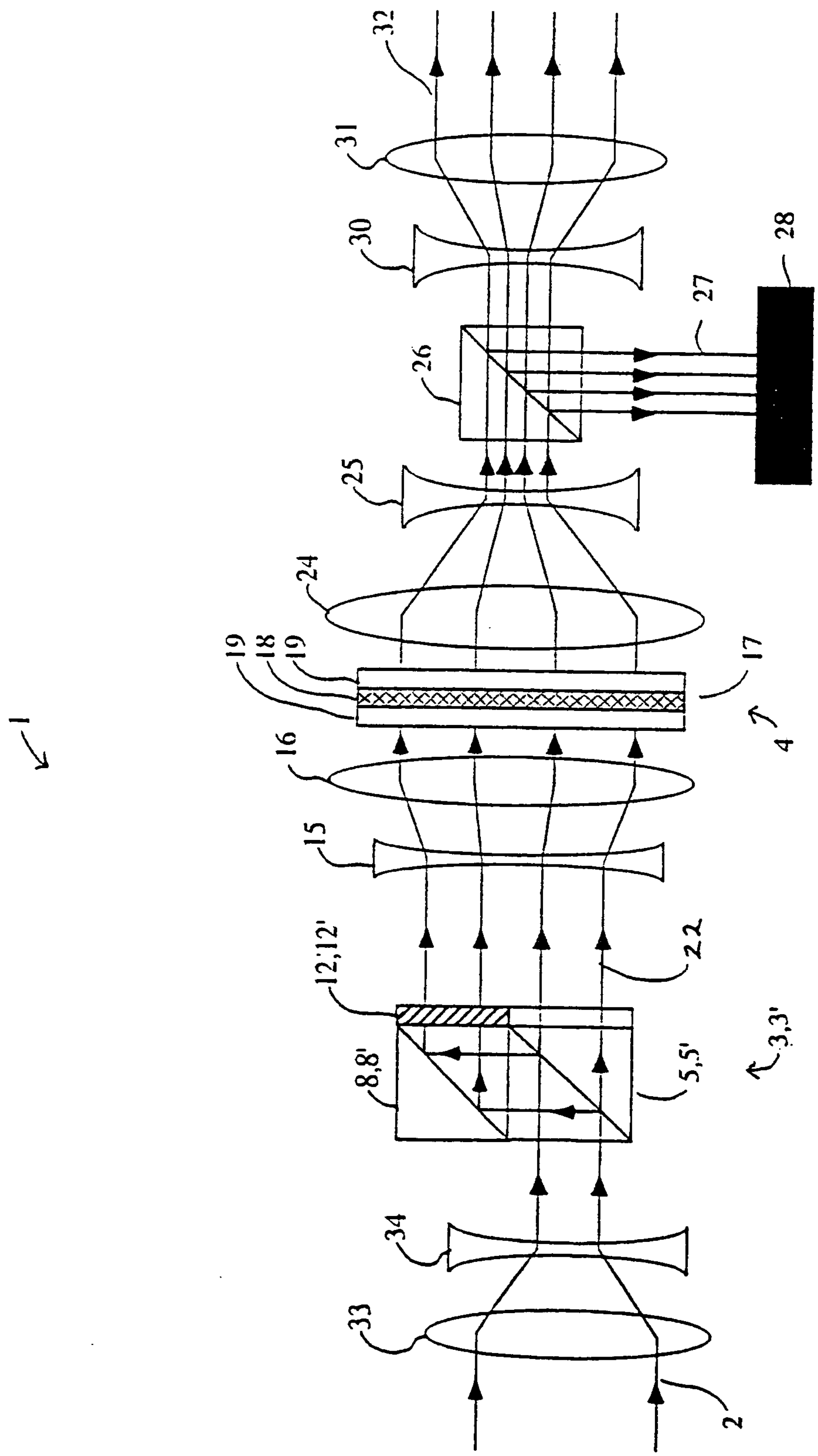

FIG. 4

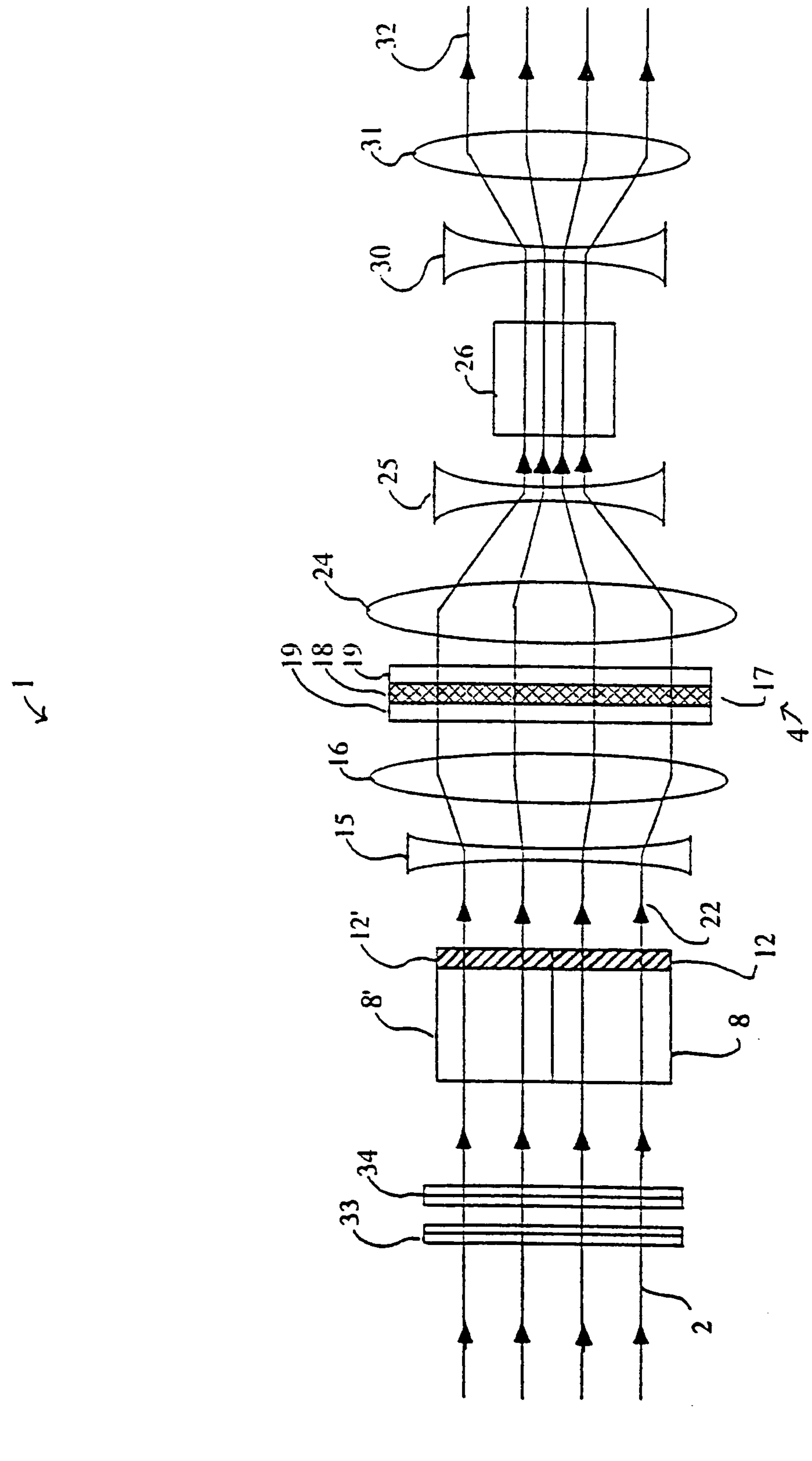

FIG. 5

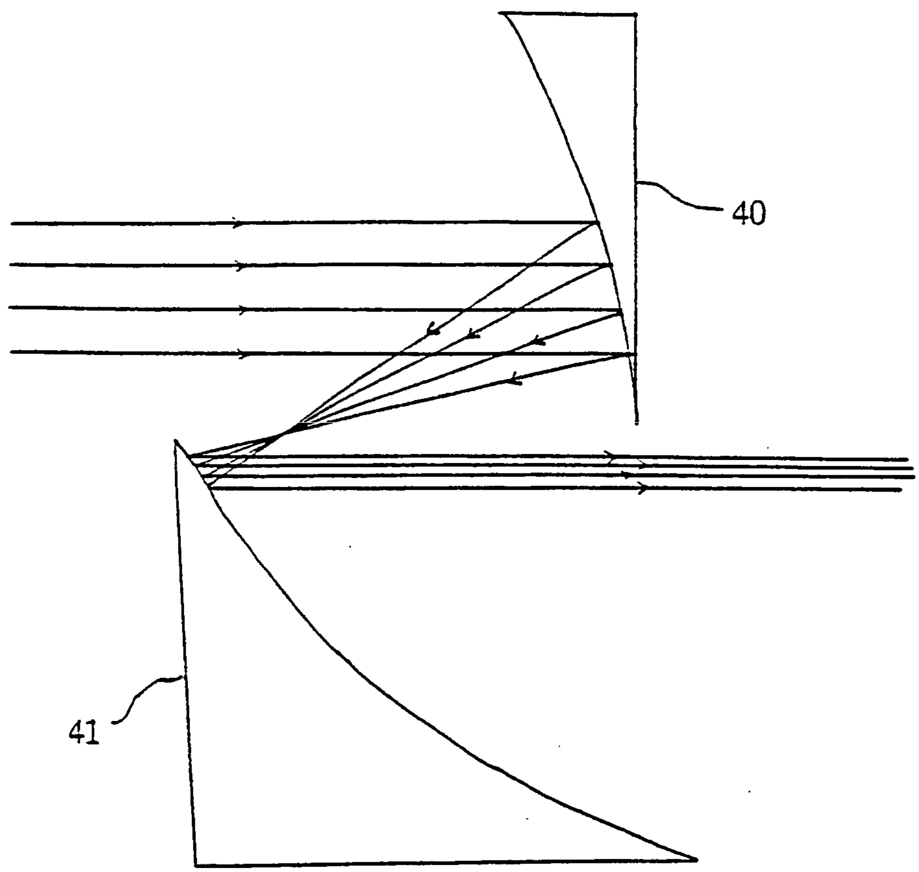

FIG. 6

INTERNATIONAL SEARCH REPORT

Int .tional Application No
PCT/GB 97/02758

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G02B27/28 H04N9/31 F21P5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G02B H04N F21P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 492 636 A (CANON KK) 1 July 1992	1,3,18, 20,21,23
Y	see figures 11,19	2,4,22
A		7-15,19

X	EP 0 361 559 A (PHILIPS NV) 4 April 1990	1,3,18, 20,21,23
A	see the whole document	4,7,8, 13-15, 19,22

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
24 February 1998	05/03/1998
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Ward, S

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 97/02758

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	see abstract; figures	4,7,8, 13-15, 19,22
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